Potholes Repair Technology- A Review
Tanuj Parmar1 Prof. C.B. Mishra2 Dr. Sangita3 Prof. N.F Umrigar4
1ME Student 2Associate Professor 3Sr. Pr. Scientist 4Assistant Professor
BVM engineering college, V V nagar, anand, India 3Pavement Engineering Area, CSIR-CRRI, New Delhi, India

Abstract— Road development part is considered as one of the significant hotspots for monetary development and improvement of a nation. The idea of cold mix forms has been around for a long time and a wide range of structures have gone back and forth as the cold technology developed. As of late, cold mix technology innovation has made critical enhancements in quality and execution. These changes particularly in the chemicals used in the creation of the asphalt emulsions have considered more inventive employments of cold mix technology. The utilization of cold mix forms has extended the tool kit accessible to organizations to take care of their issues. The fixing of interstate spending plans has adjusted the way organizations handle development and recovery. The utilization of cold mix procedures can fill a void in the zone of restoration and recreation. Cold procedures bring down the nursery gasses in the climate as they utilize less vitality, and also cut down on the utilization of non-renewable aggregates, for example, totals and oil based items. This paper displays an outline of the different cold mix procedures being used crosswise over India and the state to which these procedures have been raised as cold mix technology has extended and improved.

Key words: Potholes, cold mix technology

I. INTRODUCTION
Growing worries on environment and nursery sway, joined with extended improvement costs incited the headway of new developments by the Asphalt business to convey Asphalt Concrete (AC) pavement. Expansive investigation is being done to evaluate the impact and execution of these new headways. Cold mix is the nonspecific term for various bituminous procedures, which uses asphalt emulsions, aggregates, reused bituminous materials and a mix plant, which does not have an aggregate dryer. Cationic emulsions took into account speedier setting times and less powerlessness to climate conditions because of their compound break. In the late 1970's the utilization of reclaimed asphalt pavement (RAP) began to end up exceptionally well known in the hot mix industry. Keeping in mind the end goal to use this important asset the emulsion business began to create items to permit the utilization of RAP and RAP/virgin aggregate in cold mix forms. The advancement of restoration sort emulsions opened up a zone of reusing which did not exist some time recently. As the innovation advanced cold mix forms developed through the use of mixes of emulsions, for example, rejuvenators being mixed with routine asphalt emulsions.

The suppliers of the asphalt emulsifiers used to deliver the asphalt emulsions have turned out to be more mindful of the mechanical advances in cold mixes. These suppliers work with the business to create claim to fame chemicals, which give added advantages to the cold mix forms. These new chemicals have increased present expectations in the utilization of cold mix forms.

II. ADVANTAGES OF COLD MIXES
1) Environmentally and energy efficient technology for repair
2) Uniform quality of mix with high stability
3) Resistance for deformation, bleeding and cracking
4) Resistance to stripping by water
5) Resistance to pushing after placement
6) Instant setting and fast development of strength
7) Preparation of surface for repairs in minimal
8) Repairs in possible in all adverse climate including wet condition
9) No wastage of materials and minimum manpower needed

III. LITERATURE SURVEY
Lokeshwor huidrom 2011 [1] Potholes, cracks and patches are some types of road surface distresses whose assessment is essential in India. In the current field practices, road distress data assessment is reported to be done through distress data collection and processing of the collected raw data. At present, distress data collection is increasingly being automated by using various imaging systems. However, analysis of the collected raw video clips for distress assessment is still predominantly being done manually. This is expensive, time consuming and slows down the road maintenance management. In this paper, a robust method for automated detection and assessment of potholes, cracks and patches from real life video clips of Indian highways is proposed. In the proposed method, potholes, cracks and patches are detected and quantified automatically using various image processing techniques supported by heuristically derived decision logic. For testing its performance, the proposed method has been implemented under a Windows environment using Open CV library. The results are evaluated through accuracy and precision recall metrics and compared with the methods presented by earlier researchers as well as current practices in the field. And the proposed method is found to be more robust and efficient. The information extracted using the proposed method can be used for determining maintenance levels of Indian roads and taking further appropriate actions for repair and rehabilitation.

Prithvi singh kandhal, 2008.[2] Development of potholes on road and street of India after the onset of monsoon is a common phenomenon. Quite often potholes are repaired with antiquated technique, such as placing soil or bare aggregate in the potholes because no hot mix asphalt is availability during monsoon.

An economical, generic, readymade stockpile cold patching mix has proposed which is manufactured in a batch type hot mix plant using local aggregate. This generic mix can be placed without preparing the pothole. Such as drying squaring the edges. Cleaning and tack coating. This patching
The SHRP study on potholes in Rajasthan during monsoon have been highly successful. This mix can be stockpiled and remains workable for at least 6 months and therefore it can be used throughout the year including the rainy season.

Wilson and romine, 1993.[3] In Strategic Highway Research Program (SHRP) Report H-348, a cohesion test is recommended to quantify the cohesion of cold mixes. Although this test does not guarantee success of a mix, it indicates potential for poor performance of a mix. To perform the test, 1,200-gram samples of a mix are cooled to 4 °C (39.2 °F). The mix sample is compacted using the Marshall mould and hammer. Five blows of the Marshall hammer are applied to each side of the specimen. After compaction the weight is recorded and the specimen is placed along the bottom edge of a 305 mm diameter sieve (245.4 mm openings), while both the sieve and the sample are standing on end. A cover is placed on the sieve while still on end, and the sieve is rolled back and forth twenty times. With the sample still inside, the sieve is laid against the edge of a table, allowing room for sample pieces to fall through the sieve openings (for 10 seconds). The remaining material is weighed and reported as percentage retained. A minimum retention value of 60 percent is recommended.

Evans, mojab et al., 1992; wilson and romine, 1993.[4] The SHRP H-106 study was probably one of the most extensive pavement maintenance experiments to date (Evans, Mojab et al., 1992; Wilson and Romine, 1993a; Wilson and Romine, 1993b; Wilson, 1998). At eight locations located throughout the U.S. and Canada, 1,250 patches were placed. The patches in Greenville, Texas, on FM 1570 and in Las Vegas, New Mexico, were important because the climates there are typical of the wet and dry climates in Texas. It is notable that most other types of patching materials had high survival rates after more than 1 year of service (> 67 percent), while the local Texas material had only a 20 percent survival rate after only 5 weeks, and there were no patches that lasted a year. The SHRP study on development of materials for pothole repair included a series of tests of the materials evaluated. The laboratory testing was an attempt to identify and measure pertinent material characteristics that could be used to predict the performance of the materials in the field. The tests performed on the materials were intended to characterize properties of the mixture as well as the aggregate and the binder. Most of the tests performed were originally developed for hot-mix asphalt materials. Because of the different properties of the cold mixes, the materials were aged in an oven to simulate field conditions prior to testing. A complete list of the tests performed follows:

- Resilient modulus at 25 °C and three frequencies;
- Marshall Stability and flow, ASTM D 1559;
- Sieve analysis, ASTM D 136;
- Binder content, ASTM D 2172;
- Penetration (recovered binder only), ASTM D 5;
- Ductility (recovered binder only), ASTM D 113;
- Softening point (recovered binder only), ASTM D 36;
- Viscosity (recovered binder only), ASTM D 2171;
- Workability
- Maximum and bulk specific gravity, ASTM D 2041 and D 2726;
- Water susceptibility, ASTM D 1664.

Anderson, thomas et al., 1988.[5] The primary purpose of the Pennsylvania Transportation Institute (PTI) study (Anderson, Thomas et al., 1988) was to develop and test an improved cold-mix, stockpiled patching material for the repair of asphalt pavements during cold, wet weather conditions. The failure mechanisms were identified, and performance requirements were developed. These performance requirements were used to develop a series of experimental binders. The binders were evaluated in the laboratory, and five experimental binders were recommended for field trials. A total of 410 repairs were made with the PennDOT control mixture and different experimental mixtures.

Kandhal and mellott, 1981; roberts, kandhal et al., 1996.[6] The cohesive and adhesive properties of a mix are mainly dependent upon the composition of the mortar (asphalt binder and fines). The presence of excess fines or dust (material passing sieve No. 200 or 0.075 mm) in the mixture results in a mortar that is lean, less tacky, and friable. The absence of excessive fines causes mixtures to be very tacky and sticky; therefore, tack-coating of the pothole may not be required. Many conventional stockpile patching mixtures do not perform satisfactorily because of excessive fines. Such mixes are dull and friable, and lack cohesive and adhesive qualities.

Paterson (1987) describes potholes as being the result of the break up and loss of surface material, which in turn leads to the weakening of base material. Paterson distinguished this from ravelling by stating:

“A pothole is a cavity in the road surface which is 150mm or more in average diameter and 25mm or more in depth.”

Roberts et al. (1996) [7] defines potholes as:

“Small, bowl-shaped depressions in the pavement surface that penetrate all the way through the HMA layer down to the base course. They generally have sharp edges and vertical sides near the top of the hole. Potholes are most likely to occur on roads with thin HMA surfaces (25 to 50mm (1 to 2 inches) and seldom occur on roads with 100mm (4 inch) or deeper HMA surfaces.”

The FHWA (2003) [8] report Distress Identification Manual for Long-term Pavement Performance Program further states that low severity potholes are approximately less than 1 inch deep, moderate are 1-2 inches deep and high severity greater than 2 inches deep, all with a minimum width of 6 inches.

IV. REVIEW ABOUT COMMERCIALY AVAILABLE POTHOLE REPAIR MIXES

A. Bond It Instant Pothole Repairer:

This repaire is used in United Kingdom which is suitable to be used for roads, driveways and car parks patch repair. It can be trafficked instantly in any season. It is applicable for 100mm depths (layer-on-layer method for greater depths). It is supplied in 25kg bags, storage life of 6 months.
B. Degafill Pothole Repair:
It is manufactured from advanced methyl methacrylate resin. It can be applicable for highway pothole repair, car park pothole repair, footpath, ironwork re-instatement and minor carriageway repairs. Its cure time is about 20 minutes. It is available in pack of 27kg.

C. Dr. Fixit Pothole Repair:
This pothole repair material is used in India for filling up the potholes. It is composed of polymer modified bituminous emulsion polymer. It is made with the ASTM specifications D2489:2 standards. It can be used for repair of concrete and bituminous roads and pavements. It comes in 25kg and 50kg bags. It covers approximately 1m² area per 100 kg with 50mm thickness. It has a shelf life of 12 months.

D. Ronaroad Greenpatch Pothole Repair:
This repair is also used in U.K. It can be applied in wet, dry and damp surfaces in temperature range from -20°C to 50°C. It is supplied in pack of 22.7kg plastic pails and plastic sacks. It has shelf life of 10months. It covers an area of 0.26m² at 50mm thickness per pack.

E. Ultracrete Instant Road Repair:
It is used in Brazil. It comes in two grades, 6mm for permanent repairs in highways, footpaths and cycle tracks and second 10mm for other type roads. It is supplied in 25kg bags. It has a shelf life of 3 months for bags and 6 months for tubs. It covers about 1m² area at 12-15mm compacted layer.

F. Kandhal Patch Repair:
It is newly manufactured pothole repairer developed according to Indian condition. It can be used in any season and doesn’t require any skill labour. It is easy to apply.

G. Sealkotes Patch Mix:
It is a special adduct of asphaltic polymers adhesives. It requires no heating, can be premixed and stored. It can be applied in cold as well as in waterlogged areas also. Also, it can be opened to traffic in less than 40minutes.

V. CONCLUSION
Emulsion based cold mixes have come a long way in the last few years. The mixes are made up for a variety of uses and provide a lot of options for road construction and maintenance. There are still a lot of areas of cold mix that have yet to be fully explored. The use of the proper emulsion is critical to the overall performance. Many companies are investigating the potentials of cold mix and innovation is the key.

Depending on the process it can be used as base or as a surface course. As placement of cold mix is accomplished at ambient temperature, the need to keep hot mix at high temperatures does not apply. This means that a project has more flexibility and the construction deadlines can be more easily managed. This is especially true when using cold mix products that can be stockpiled.

REFERENCES